METHODS AND EQUIPMENT

for

EVISCERATING TURKEYS

Marketing Research Report No. 1006

Agricultural Research Service
UNITED STATES DEPARTMENT OF AGRICULTURE
in cooperation with
The University of California Agricultural
Experiment Station

PREFACE

This research on methods and equipment for eviscerating turkeys is similar to a study of the same processing operation for chickens reported by R. E. Childs and R. E. Walters in U.S. Department of Agriculture Marketing Research Report No. 549, "Methods and Equipment for Eviscerating Chickens," 1962. This study is a part of a larger research project covering the development of improved work methods, equipment, and related facilities for handling, processing, storing, and marketing turkeys.

The writers acknowledge the wholehearted cooperation of management and workers in the California turkey-processing plants studied, and of USDA inspection personnel stationed in these plants, who contributed significantly to the meaningful results of the study.

CONTENTS

	Page
Summary	
Introduction	1
Description of eviscerating operation	1
Analysis of labor requirements for eviscerating operation	2
Transferring birds to eviscerating line–Element 1	3
Removing shanks–Element 2	4
Removing oil gland–Element 3	6
Slitting and peeling back neck skin–Element 4	7
Hanging bird in three-point suspension–Element 5	7
Evacuating large intestine–Element 6	8
Removing vent and incising abdomen–Elements 7 and 8	8
Drawing viscera–Element 9	9
Processing giblets–Elements 10, 11, and 12	10
Releasing head from shackle and conducting house inspection of body cavity–Element 13	11
Removing head mechanically	13
Trimming neck skin–Element 14	13
Removing crop–Element 15	13
Removing lungs–Element 16	13
Washing bird inside–Element 17	14
Washing bird outside	14
Severing neck vertebrae–Element 18	14
Preparing bird for wrapping–Elements 19, 20, and 21	15
Work station layout	16
Influence of line speed on crew balance, production rate, and operating efficiency	17
	20
Appendix	
A. Description of methods-time-measurement technique with illustrated analyses forms	23
B. Removing vent and incising abdomen by J-cut method	23
C. Inserting metal trussing clip–Element 22	23
	24

Trade names are used in this publication solely for the purpose of providing specific information. Mention of a trade name does not constitute a guarantee or warranty of the product by the U.S. Department of Agriculture or an endorsement by the Department over other products not mentioned.

Washington, D.C.

November 1973

For sale by the Superintendent of Documents, U.S. Government Printing Office
Washington, D.C. 20402

METHODS AND EQUIPMENT FOR EVISCERATING TURKEYS

By William L. Shupe, Edward W. Spangler, A. W. Brant, and John A. Hamann[1]

SUMMARY

Detailed descriptions were developed and labor requirements were determined by methods-time measurement (MTM) analyses for each processing step in the turkey-evisceration operation in commercial turkey-processing plants. The time values developed provide precise information on labor requirements for each successive step in the eviscerating operation and form a base from which management can design the most efficient eviscerating-crew composition.

The results of the analyses, applied to selected situations in case study plants, showed that the most efficient production rate for hen turkeys is 1,260 birds per hour with 34 workers, a rate that results in a labor utilization of 85.1 percent. When the same crew eviscerates tom turkeys at the maximum rate of 960 birds per hour, labor utilization drops to 74.2 percent. On the other hand, if a lower line speed of 840 birds per hour is used, with 29 workers, 76.3 percent of the labor is utilized. Similar calculations were developed and are described for a wide range of crew sizes and production rates. The labor requirement values for alternate methods for some of the eviscerating operational work procedures are also given.

Methods and equipment used in performing some procedures are reported to be cumbersome, awkward, and tiring, with the result that worker efficiency is reduced and production rates are lowered. Examples of labor savings through modest investments in mechanized equipment are explained. Work station layouts that minimize worker fatigue and provide maximum efficiency are illustrated.

INTRODUCTION

Approximately 1 1/2 billion pounds of turkey were certified in 1969 as "ready to cook."[2] This figure reflects an increase of more than 33 percent since 1959.[3] The increase can be attributed to three factors: (1) Turkey is being made available to the consumer on a year-round basis. (2) The price relationship with competing meat items is favorable. (3) Numerous convenience items, such as boned turkey roasts, turkey logs, and heat-and-serve items, are becoming more acceptable.

To maintain the favorable price relation with competing meat items and to prepare the many convenience items, most turkey-processing plants operate on a

[1]William L. Shupe, mechanical engineer, and Edward W. Spangler, engineering technician, Western Region, Agricultural Research Service; John A. Hamann, laboratory chief, Agricultural Marketing Research Institute, Agricultural Research Service, Beltsville, Md.; A. W. Brant, food technologist, University of California, Davis.

[2]United States Department of Agriculture. Agricultural statistics 1970. U.S. Dept. Agr. 627 pp. Washington. 1970.

[3]United States Department of Agriculture. Agricultural statistics 1960. U.S. Dept. Agr. 633 pp. Washington. 1960.

year-round basis. Year-round operation has been made possible by supplementing the seasonal slaughtering and dressing operations that previously prevailed with extensive further-processing operations.[4] As a result, turkey processors are able to provide year-round employment to their workers. With year-round operation, many plants have had to modernize their food-processing facilities. In addition, they have had to retrain seasonal workers or train new people for jobs that involve greater skill levels and higher pay scales.

Because the eviscerating operation is relatively complex and demands a large share of the labor requirements in turkey processing, this operation was selected for evaluation and improvement to gain maximum worker productivity. Little precise information on methodology, labor requirements, and work station layout is available. Criteria for crew size and balance in relation to line speed is nonexistent. In conducting these studies, case study plants were selected in which typical commercial conditions existed. Many "best ways" for performing most of the job assignments in the eviscerating operation were found. To develop acceptable criteria as to which methods were actually best under various types of operating conditions, average workers[5] were studied. Then, by screening for the most efficient method[6] of performing each processing step in good eviscerating operations, guidelines for optimum worker utilization and crew balance for a range of production rates were established through application of the methods-time-measurement (MTM) analysis technique. This technique is described in appendix A to this report.

DESCRIPTION OF EVISCERATING OPERATION

When turkeys are prepared in ready-to-cook form, the eviscerating operation includes removing the viscera, head, neck, feet (with shanks), and preen gland from birds that have been bled and defeathered. The operation also includes harvesting (trimming and cleaning) the giblets (heart, liver, and gizzard), Federal inspection, trimming bruised or contaminated tissue, house inspection, washing the carcass inside and out, and grading and trussing the drumsticks.

All eviscerating processing steps illustrated in figure 1, with the exception of USDA inspection, trimming (by USDA inspector), and grading were evaluated as to labor requirements during the studies for this report.

Because of the importance of bird size to the processing operation, hens and toms (hens 10 to 16 pounds; toms, 18 pounds and up) were processed at different times and were studied separately. A typical production rate for hens on single-line conveyors averaged 18 per minute, or 1,080 per hour; the rate for toms averaged 12 per minute, or 720 per hour.

Some plants doubled their production rate by doubling the number of bird shackles on the same overhead (twin-shackle line) conveyor line (fig. 2), or by adding another complete conveyor system (dual line) (fig. 3) to the original system and using the same eviscerating trough for both conveyor lines. In each instance another complete eviscerating crew was added to the work force. This practice reduced the production cost per bird by decreasing equipment and space requirements, in addition to fully utilizing the production capacity of the slaughtering and defeathering facilities. The system that employs two conveyors (dual line, fig. 3) provides flexibility by allowing for quick adjustments if one line breaks down or is slowed for some reason.

[4] A term used by the poultry-processing industry for such operations as boning, cutting up the whole carcass, and cooking and preparing specialty items.

[5] Individuals capable of performing acceptable work at a normal rate for an extended period of time.

[6] The method requiring the least effort and smallest time requirement, causing the lowest product-contamination level, and providing the greatest yield of end product.

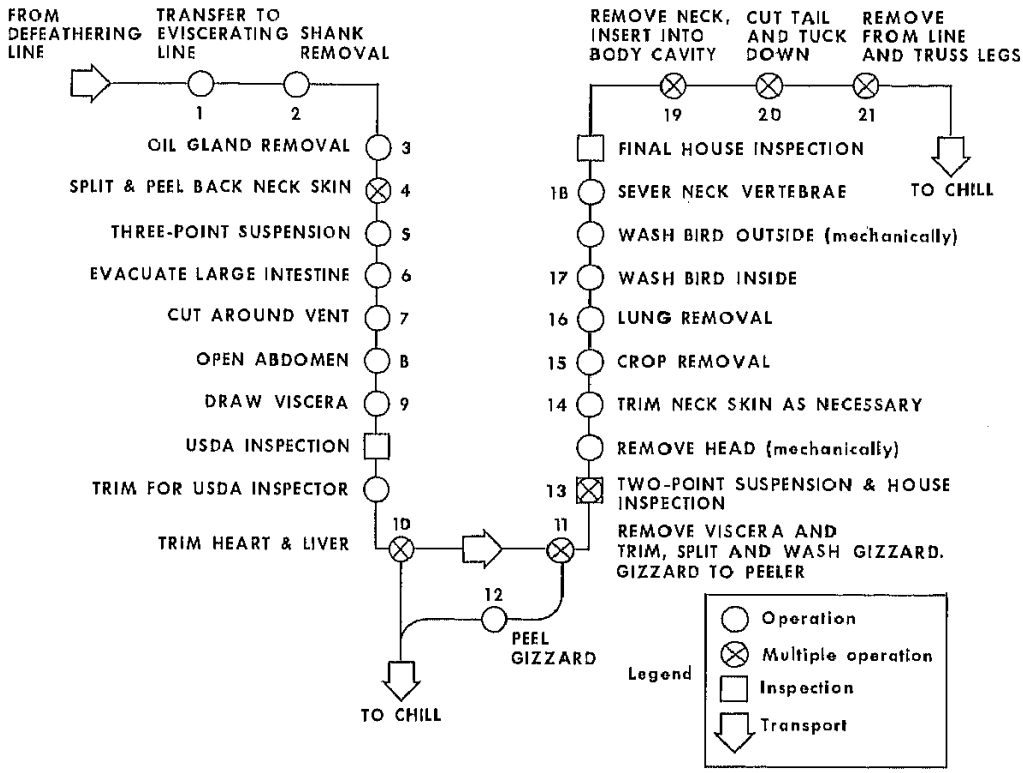


Figure 1.–Flow process chart of eviscerating operation.

ANALYSIS OF LABOR REQUIREMENTS FOR EVISCERATING OPERATION

Work methods employed in the turkey-eviscerating operation were analyzed in three typical plants by applying time values predetermined by applying methods-time-measurement (MTM)[7] techniques to each work element of each processing step in the eviscerating operation.

The time values predetermined through MTM were confirmed by being compared with the actual time taken to complete each element.[8] Actual time was determined by photographing the various work elements with a constant speed motion picture camera. At each of the three case study plants, five successive sequences of each element in each plant's evisceration operation were timed, photographed, and compared in this manner. When extreme differences occurred, adjustments were made after reevaluation. The MTM times values (converted to minutes) were slightly shorter than the actual time taken to do the work.[8] A 5-percent fatigue

[7] In MTM analysis, "element" ("work element") is the term used for a related series of hand movements required for fulfillment of a specific job assignment in a processing step. One worker may perform several sequential elements, or a crew of workers may be required. Crew composition and efficiency in relation to the MTM evaluation of the various work elements described in this report are discussed on pages through Most of the processing steps in the turkey evisceration operations analyzed for this report correspond to one MTM element. Several, however, such as the giblet processing step and the step in which the bird is prepared for wrapping, contain more than one element. Other processing steps, such as the step in which the head of the turkey is removed and the step in which the outside of the turkey carcass is washed, are performed entirely by mechanical methods and thus do not contain a labor factor (element).

[8] Based on actual time recorded in a motion picture of each operation.

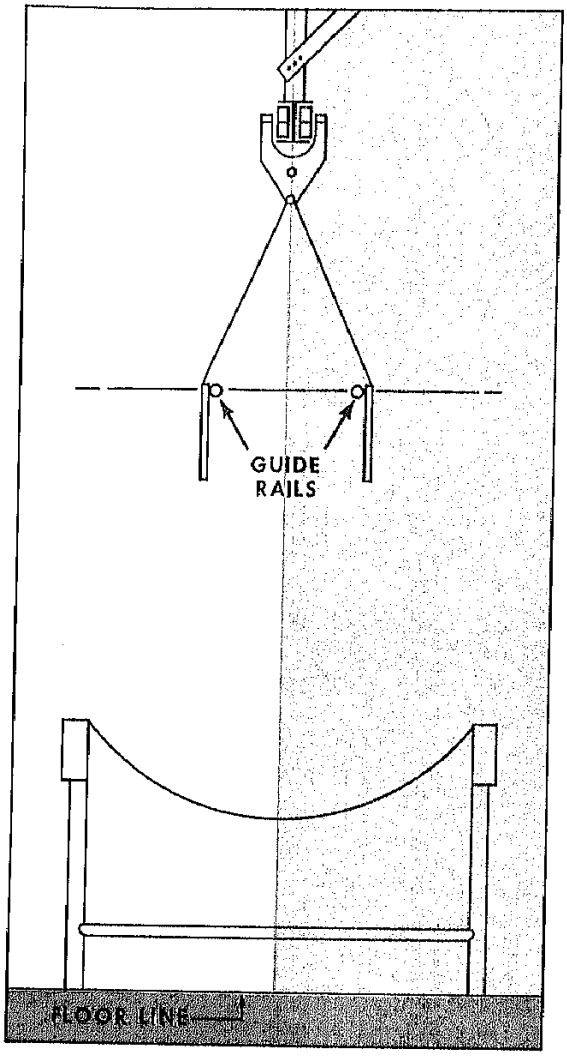


Figure 2.—Cross-sectional view of eviscerating line with twin-shackle conveyor.

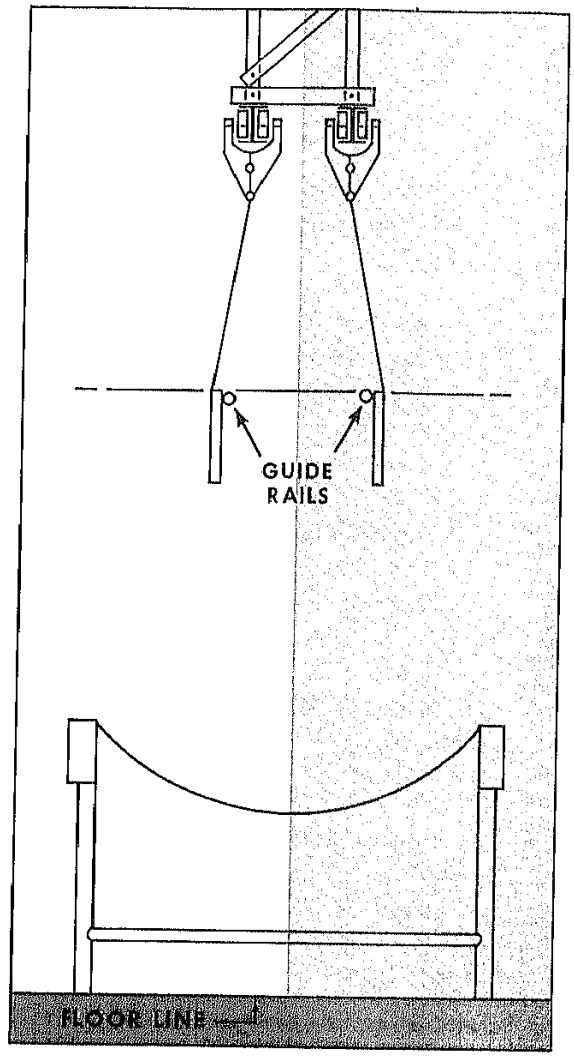


Figure 3.—Cross-sectional view of eviscerating line with dual conveyor.

allowance was added to all MTM values. At a few stations where workers' exertion was greater than normal (hanging birds on line, drawing viscera, removing crop, and so forth), another 5-percent allowance was added.

Transferring Birds to Eviscerating Line—Element 1

After the birds have been defeathered and washed, they are transferred from the defeathering line to the eviscerating line. This transfer may occur either before or after the shanks have been removed. The birds may be transferred in either the picking room or the eviscerating room, depending on the plant layout and the available space. Separate overhead conveyors for the defeathering and the eviscerating operations are necessary to move the birds at the different rates of line speed required for the two operations and to minimize contamination hazards from equipment (conveyors) used in the slaughtering, scalding, and defeathering operations that are performed preparatory to evisceration.

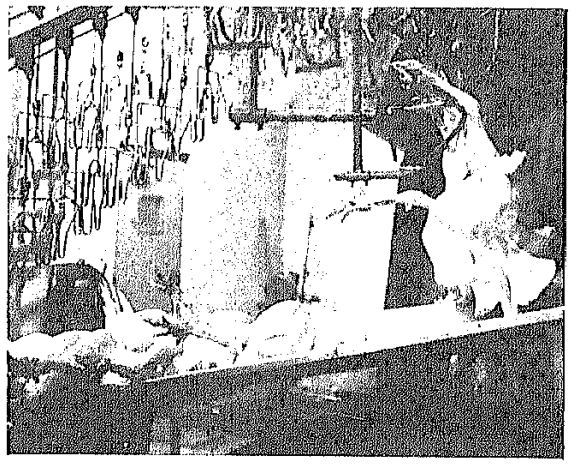
The method of transfer depends on factors such as the type of picking equipment used, plant layout, available space, type of shackles used, and the preference of plant management. With the number of variables involved, variations in methods of transferring birds from one line to another can be unlimited. Because of the many variations, two methods of transfer were used in the analysis of the bird transfer processing step: The direct method (fig. 4) and the indirect method (fig. 5). In terms of the MTM analysis, either method corresponds to one work element.

PN-2673

Figure 4.–Direct transfer of turkey carcasses from defeathering line to eviscerating line.

Direct Transfer

As the bird on the defeathering line moves toward the worker, the worker grasps and steadies the shackle with his left hand while his right hand grasps the bird by its neck and lifts its head from the shackle. He releases



PN-2674

Figure 5.–Birds on defeathering line are released mechanically to conveyor below and rehung on eviscerating line during indirect transfer.

the shackle, places his left hand under the bird to help support it, and then lifts the bird and places its head into the shackle on the eviscerating line (approximately 18 inches distance). Labor requirements for these procedures were 0.685 man-minute per 10 hen turkeys and 0.869 man-minute per 10 tom turkeys, for a production rate of 3.09 more hen turkeys than tom turkeys per minute of operation.

Handling the heavier carcass of the tom turkeys not only required more time for each motion but was also more tiring; therefore, a 10-percent fatigue allowance was required instead of the 5-percent allowance allotted for handling hens. This additional fatigue allowance is one of the factors reflected in the slower production rate for tom turkeys.

Indirect Transfer

The bird is released from a mechanical trip shackle on the defeathering line onto a table-height conveyor belt (18 inches below). As the bird on the moving belt approaches the worker, the worker grasps the bird's neck with his right hand and positions and steadies the shackle with his left hand. He lifts the bird's head to the shackle and inserts its neck in the shackle slot to pin its head. The upward sweep of the eviscerating conveyor beyond the operator lifts the bird clear of the conveyor. The worker lifts only the neck and head weight of the bird when he inserts its neck into the shackle slot. Labor

requirements for these procedures were 0.415 man-minute for 10 hen turkeys and 0.461 man-minute for 10 tom turkeys, for a production rate of 2.41 more hen turkeys than tom turkeys per minute of operation.

Table 1 shows that the indirect method of transferring birds to the eviscerating line is the most efficient, allowing transfer of 9.50 more hen turkeys per minute and 10.18 more tom turkeys per minute than the direct method.

Removing Shanks—Element 2

Two methods are generally used for removing the shanks: With one method, a handknife is used to cut through the leg at the hock joint (fig. 6); with the other method, air-actuated shears (fig. 7) snip off the shanks. Shank removal is generally performed immediately after the birds are hung on the eviscerating line and is considered to be the first step in preparing the bird in ready-to-cook form. Either method of performing this processing step corresponds with one MTM work element.

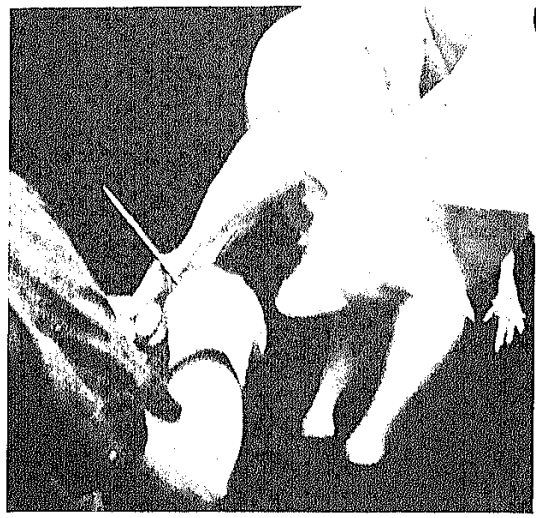
Shank Removal With Handknife

As the bird approaches, suspended by its neck, the worker grasps both of its shanks in his left hand, bends the shanks back to open the knee joints, positions his knife at the knee joint sockets with his right hand, cuts through the joints to remove both shanks simultaneously, and then tosses the shanks into the offal container. Labor requirements for these procedures were 0.503 man-minute per 10 hen turkeys and 0.690 man-minute per 10 tom turkeys, for a production rate of 5.37 more hen turkeys than tom turkeys per minute of operation (table 2).

TABLE 1.—Production rates and labor requirements for direct and for indirect methods of transferring hen and tom turkeys from defeathering line to eviscerating line[1]

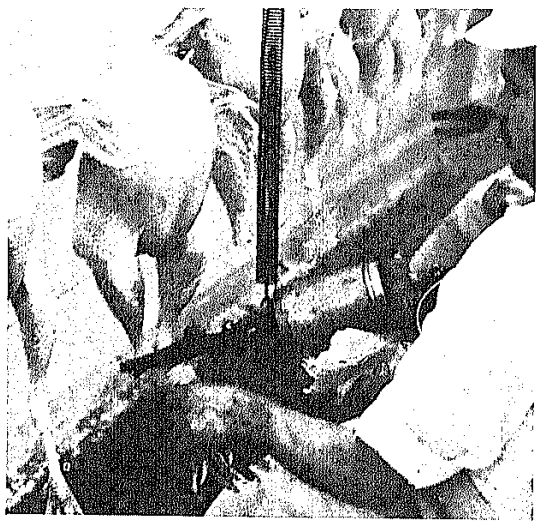
Method and turkey class	Labor requirement	Production rate
	Man-min./ 10 birds	*Birds/min.*
Direct transfer:		
Hens	0.685	14.60
Toms	.869	11.51
Indirect transfer:		
Hens	.415	24.10
Toms	.461	21.69

[1] Computation of time values is shown in appendix A.



PN-2675

Figure 6.—Removing shanks with a handknife.



PN-2676

Figure 7.—Removing shanks with air-actuated shears.

Shank Removal With Air-Activated Shears

As the bird moves toward the worker, the worker grasps its shanks with his left hand, pulls the bird toward air-actuated shears that are suspended on an overhead balancing spring, swings the shear jaws into position around the shank joints with his right hand, activates the shears, and then tosses the shanks into the offal container. Labor requirements for these procedures were 0.513 man-minute for 10 hen turkeys and 0.673 man-minute for 10 tom turkeys, for a production rate of 4.63 more hen turkeys than tom turkeys per minute of operation (table 2).

Labor requirements were nearly the same for the shears method and the knife method. Most plants preferred the knife method, as it avoided the use of costly equipment and maintenance. The knife does a more accurate job of cutting through the knee joints, thereby minimizing bone chips that occur when shears are used and not positioned accurately.

Removing Oil Gland—Element 3

The worker grasps the bird by its tail with his left hand. He first positions, then holds the bird while he cuts out its oil gland with a slicing motion of the knife held in his right hand (fig. 8). Considerable care is required in positioning the knife to avoid the removal of excess tissue. These procedures were the least time consuming of any in the eviscerating operation. A worker performing this work element at an average pace worked only about 50 percent of the time, a factor that contributed to line imbalance.

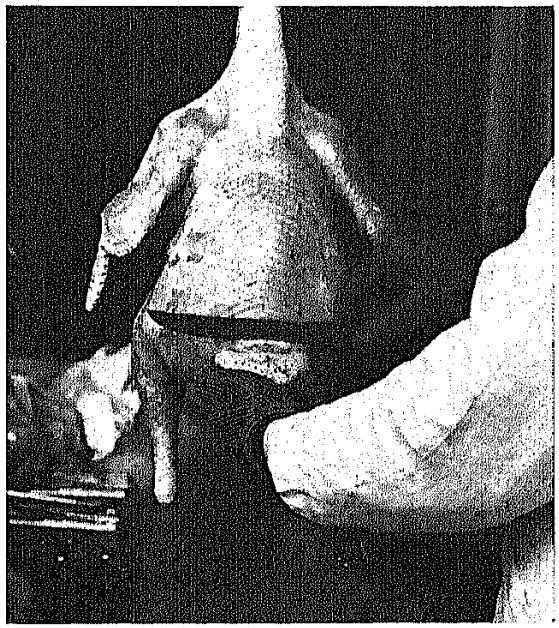
TABLE 2.–Production rates and labor requirements for removing hen and tom turkey shanks by handknife and by air-actuated shears

Method and turkey class	Labor requirement	Production rate
	Man-min./ 10 birds	*Birds/min.*
Handknife:		
Hens	0.503	19.87
Toms	.690	14.50
Air-actuated shears:		
Hens	.513	19.48
Toms	.673	14.85

Labor requirements for oil gland removal were 0.340 man-minute for 10 hen turkeys and 0.358 man-minute for 10 tom turkeys, for a production rate of 1.59 more hen turkeys than tom turkeys per minute of operation.

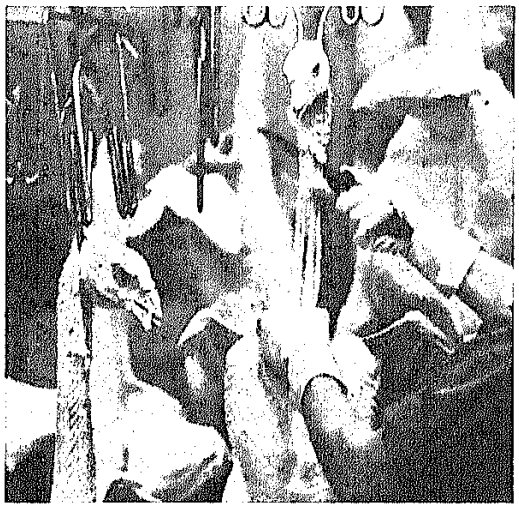
Slitting and Peeling Back Neck Skin—Element 4

As the bird on the overhead conveyor approaches the work station, suspended by its neck, the worker's left hand steadies the bird while his right hand (holding knife) slits its neck skin (fig. 9) from the base of the skull to the shoulders. His left hand grasps the neck skin and pulls it away from the neck at the top of the slit (near skull). With his right hand he inserts the knife between the neck and the loosened skin and severs the skin near the base of the skull. With his left hand he then peels the severed skin away from the neck, while he steadies the bird with his right hand. The loosened skin is left hanging free of the neck bone. Continuing with his knife in his right hand, he slits the membranelike tissue at the crop and along the windpipe, exposing these parts so that they can be removed easily after the head has been removed in a subsequent processing step.



PN-2677

Figure 8.–Removing the oil gland from turkeys.



PN-2678

Figure 9.—Slitting neck skin.

The time required for these procedures were 0.667 man-minute for 10 hen turkeys and 0.915 man-minute for 10 tom turkeys, for a production rate of 4.08 more hen turkeys than tom turkeys per minute of operation. The difference in time was caused by longer moves and reaches and the greater effort required to loosen the neck skin of larger birds.

Hanging Bird in Three-Point Suspension—Element 5

To this point, the practice of hanging the bird by its neck presents the carcass to the workers in the position that best facilitates performance of the required work procedures. However, the procedures in elements 6, 7, 8, and 9 (evacuating the large intenstine, removing the vent, incising the abdomen, and drawing the viscera), can be performed more efficiently if the bird is presented to the workers in three-point suspension (hanging by the neck and both hocks, as shown in fig. 10).

To hang the bird, the worker grasps both drumsticks of the bird, one in each hand, bends them forward, lifts them up, and places them into the shackle loops on each side of the hinged neck hook.

The time required for these procedures were 0.485 man-minute for 10 hen turkeys and 0.680 man-minute for 10 tom turkeys, for a production rate of 5.89 more hen turkeys than tom turkeys per minute of operation.

Evacuating Large Intestine—Element 6

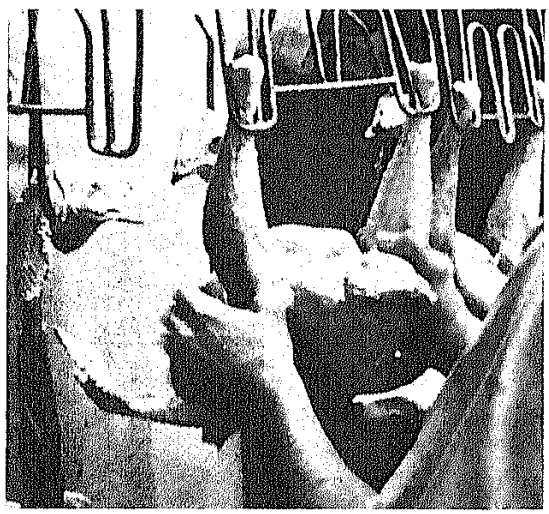
If the lower section of the large intestine contains an excessive amount of fecal material, there is a danger of gross contamination of the bird if this material is not removed before the abdomen is opened in the next processing step. The waste is removed by manually applying pressure on the abdomen or by applying a vacuum to the vent. Each method in this processing step corresponds to one MTM work element.

Evacuating Intestine By Hand

As the bird approaches, suspended by its neck, the worker grasps the bird with both hands, placing his thumbs on the bird's back and his fingers at the bird's abdomen. He then applies pressure to the abdomen to force waste material from the vent. Labor requirements for this method of evacuation were 0.435 man-minute for 10 hen turkeys and 0.452 man-minute for 10 tom turkeys, for a production rate of 0.86 more hen turkeys than tom turkeys per minute of operation (table 3).

Evacuating Intestine by Vacuum

As the bird approaches in three-point suspension, the worker grasps and steadies the bird with his left hand and inserts into vent the nozzle of a vacuum device held



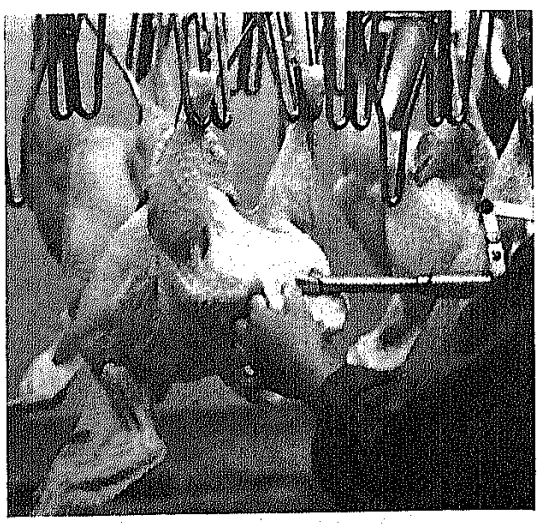
PN-2679

Figure 10.—Hanging bird in three-point suspension.

TABLE 3.–Production rates and labor requirements for evacuating the large intestine of hen and tom turkeys by hand method and by vacuum method

Method and turkey class	Labor requirement	Production rate
	Man-min./ 10 birds	*Birds/min.*
Manual:		
Hens	0.435	23.00
Toms	.452	22.14
Vacuum:		
Hens	.385	25.98
Toms	.385	25.98

in his right hand (fig. 11). He activates the vacuum to evacuate the intestine. He then withdraws the nozzle and rinses it before the next, and each successive bird approaches. The required time for this method of evacuation was the same for both hens and toms (0.384 man-minute for 10 birds). As in the oil gland removal and other low-production-rate processing steps (900 to 1,000 birds/hour), much of the worker's time on the line was spent in waiting for the next bird.



PN-2680

Figure 11.–Evacuating intestine with vacuum device.

PN-2681

Figure 12.–Trussed bird, with strip of abdomen skin serving as strap for drumsticks.

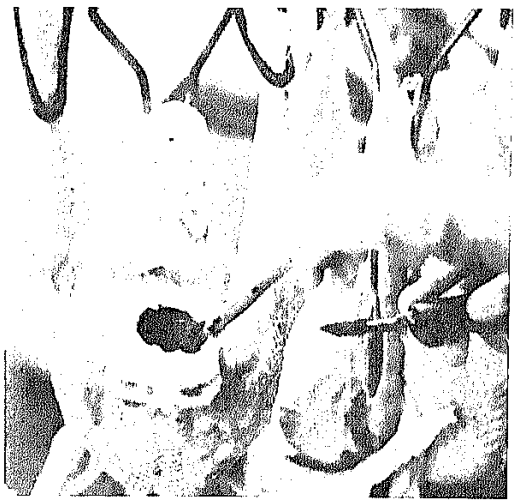
Removing Vent and Incising Abdomen–Elements 7 and 8

The processing step in which the vent is removed and the abdomen incised corresponds with two MTM work elements.

In this step of the eviscerating operation, great care must be exercised at all times by the workers to avoid piercing the intestines. A ruptured intestine, resulting in gross contamination of the interior or exterior of the bird, requires that all contaminated areas be trimmed away. This requirement results in severe losses.

Two methods are used in removing the vent and incising the abdomen. These methods are known in the poultry-processing industry as the bar-cut or strap-cut method and the J-cut method, terms related to the method of trussing used. The values of the bar-cut method are used to develop the overall labor requirements for the eviscerating operation. The bar cut leaves a strip of skin about 1 inch wide across the bird's abdomen to serve as a device for trussing the drumsticks of whole, ready-to-cook birds (fig. 12). The J-cut method is described in the appendix.[9]

[9] A description and time value analysis, as well as a comparison of the labor requirements for the bar-cut method and the J-cut method (element 22), are given in appendixes A and B.



PN-2682
Figure 13.–Removing vent by the bar-cut method.

Removing Vent–Element 7

With the knife held in his right hand, the worker inserts the index finger of his left hand into the vent and grips the vent between his index finger and his thumb, which is outside the vent. He then cuts around the vent carefully as the bird moves along on the overhead conveyor. After the vent is severed from the surrounding skin tissue, it is drawn out of the body cavity 8 to 10 inches, with the attached intestine, and is left hanging by the intestine (fig. 13).[10]

The time required for these procedures was 0.863 man-minute for 10 hen turkeys and 1.034 man-minutes for 10 tom turkeys, for a production rate of 1.91 more hen turkeys than tom turkeys per minute of operation.

Incising Abdomen–Element 8

After completing the vent removal, the worker uses his right hand to make a horizontal incision across the abdomen (from thigh to thigh), about 1 inch above the vent cut (element 7), while his left hand steadies the bird.

Then, switching to his right hand to steady the bird, he inserts the fingers of his left hand under the strip of skin between the two cuts and grasps the hanging intestine and vent and pulls them through the horizontal abdomen cut. Labor requirements for these procedures were 0.583 man-minute for 10 hen turkeys and 0.670 man-minute for 10 tom turkeys, for a production rate of 2.27 more hen turkeys than tom turkeys per minute of operation.

Drawing Viscera–Element 9

In removing viscera, skill and care are required to avoid contaminating the carcass. If an intestine is ruptured in the process, the areas contaminated by the contents must be trimmed away. Care and skill must also be exercised in fulfilling the requirement that the viscera of each bird retain their identity with the bird from which they are drawn until examined by the USDA inspector. This requirement is met by drawing the viscera far enough from the body cavity to allow them to be drapped over the right or left flank of the bird, but not far enough to detach them from the carcass (fig. 14).

The worker begins the evisceration of the bird by grasping and supporting the bird with his left hand, near the tail area, and inserting his right hand through the opening in the abdomen. He slips the extended fingers of his right hand over the viscera until they reach the heart.

PN-2683
Figure 14.–Viscera drawn and positioned properly for inspection.

[10] This procedure is followed in order to avoid contamination and to allow the entire viscera to be lifted out intact later in the operation.

His fingers partly encircle the gizzard in a loose grasp and then, with a slow twisting action, slip the viscera out of the body. At this point, his left hand releases its grasp on the tail area and lifts up under the viscera, with fingers extended, to help his right hand remove the viscera and drape them over the flank of the bird.

The manner in which the viscera are draped over the flank of each bird has a direct effect on several of the processing steps that follow. For rapid, accurate inspection, birds should enter the inspection area with the abdomen skin folded back, exposing the body cavity for examination by the inspector without further positioning of the viscera. The viscera should be draped so that the heart, liver, and gizzard are grouped together closely, just outside the body cavity, in full view of the inspector.

The manner in which viscera are draped over the flank of the bird also affects the giblet-trimming procedures. The giblets are more accessible and are easier to grasp if they are positioned so that they face the operator.

Labor requirements for drawing the viscera were 0.978 man-minute for 10 hen turkeys and 1.10 man-minutes for 10 tom turkeys, for a production rate of 1.10 more hen turkeys than tom turkeys per minute of operation. These procedures were more tiring than most and required a fatigue allowance of 10 percent.

Processing Giblets—Elements 10, 11, and 12

A ready-to-cook whole turkey includes a set of giblets that consist of a heart, liver, and gizzard. The giblets are wrapped in parchment or placed in a plastic bag and are usually tucked into the crop cavity. The neck is inserted in the body cavity without a wrapping. When turkeys are processed further, the giblets and necks are marketed separately; therefore, the wrapping and insertion of giblets were not included as part of the eviscerating operation.[11] The giblet-processing procedures analyzed for this report correspond with three MTM work elements (elements 10, 11, and 12), which are described in the following pages of this section.

Removing and Trimming Heart and Liver—Element 10

The most efficient method for removing the heart and liver from the bird is for one worker to snip them both off with scissors in one snip, snip them apart, trim them, and drop them into the flume conveyor for transport to the giblet-packaging station.[12]

Labor requirements for these procedures were 0.863 man-minute for 10 hen turkeys and 0.873 man-minute for 10 tom turkeys, for a production rate of 0.13 more hen turkeys than tom turkeys per minute of operation.

Detaching Viscera, and Removing, Trimming, Splitting, and Washing Gizzard—Element 11

The worker grasps the gizzard with his left hand, pulls it and all attached viscera away from the bird, and snips the entires mass loose with a pair of scissors held in his right hand (fig. 15). He then cuts the attached viscera from the gizzard and drops them into the offal trough. Holding the gizzard in his left hand, he trims it with the pair of scissors held in his right hand, splits it open (fig. 16), washes it under a water spray, and then drops it into a flume conveyor for transport to the gizzard-peeling station, which is adjacent to the eviscerating line. Labor requirements for cutting the gizzard from attached viscera and trimming, splitting, and washing the gizzard were 1.024 man-minutes for 10 hen turkeys and 1.053 minutes for 10 tom turkeys, for a production rate of 0.28 more hen turkeys than tom turkeys per minute of operation.

Peeling Gizzard—Element 12

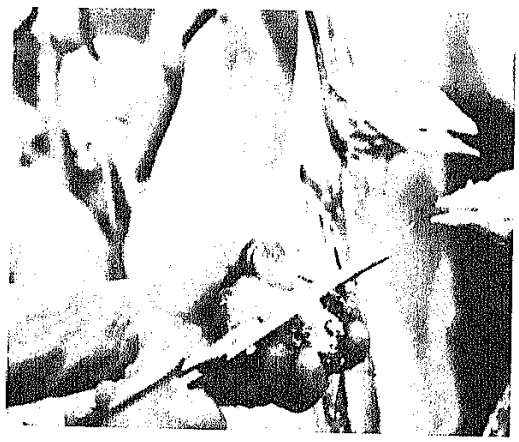
Peeling involves the removal of the fibrous lining from the opened gizzard. Two types of gizzard peelers were observed in use: (1) Semiautomatic (fig. 17) and (2) automatic. Most plants prefer the semiautomatic type because the worker holds onto the gizzard until all lining has been removed before he drops it into the flume for transport to the chiller. He uses one hand to move the gizzard from the incoming flume to the peeler table and back to the flume, while his other hand works each gizzard over the peeler rollers until it is thoroughly peeled.

[11] The labor requirement for wrapping giblets was 0.940 man-minute for 10 hen or tom turkeys. The labor requirement for inserting the package of giblets into the crop cavity was also the same for hen and tom turkeys—0.359 man-minute per 10 birds.

[12] In plants where the heart and liver were removed separately, the liver was pinched off, thus eliminating the need for handling scissors. The combined labor requirements for separate removal of the heart and liver were 1.039 man-minute for 10 hen turkeys and 1.173 man-minute for 10 tom turkeys.

PN-2684

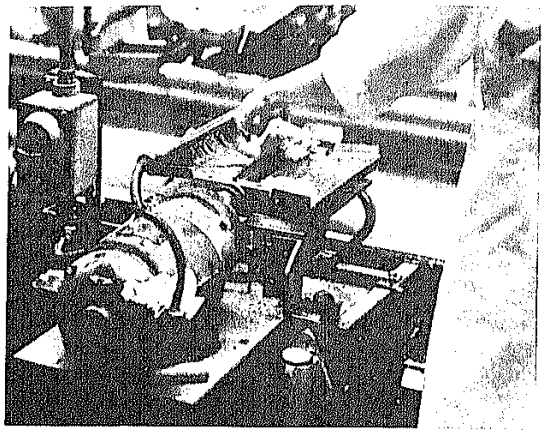
Figure 15.–Cutting attached viscera from gizzard.



PN-2685

Figure 16.–Splitting gizzard with scissors.

When the automatic peeler is used, the worker moves the gizzard from the flume to the machine, where he releases it. After peeling the gizzard, the machine automatically returns it to the flume that transports it to the chiller. The disadvantage of this method is that



PN-2686

Figure 17.–A semiautomatic gizzard peeler.

incompletely peeled gizzards that are missed by the machine must be picked out at the wrapping station and rerun for complete peeling.

Table 4 shows that a worker can process 15.2 more gizzards per minute with the automatic peeler than with the semiautomatic peeler, but that the time required to remove partly peeled gizzards that are processed automatically and to return them for repeeling reduces the production rate for the automatic equipment to a level about equal to the rate for the semiautomatic equipment.

TABLE 4.–Production rates and labor requirements for peeling gizzards of hen and tom turkeys with automatic and with semiautomatic peelers

Method and turkey class	Labor requirement	Production rate
	Man-min./ 10 gizzards	*Gizzard/min.*
Automatic:		
Hens and toms	[1] 0.372	[1] 26.88
Semiautomatic:		
Hens and toms	.856	11.68

[1] Does not take into consideration time required for rerunning incompletely peeled gizzards.

Releasing Head From Shackle and Conducting House Inspection of Body Cavity—Element 13

All processing steps in the eviscerating operation up to this point are performed more efficiently with the bird in a three-point suspension. The remaining steps in the eviscerating operation are performed more efficiently with the bird suspended by the hocks.

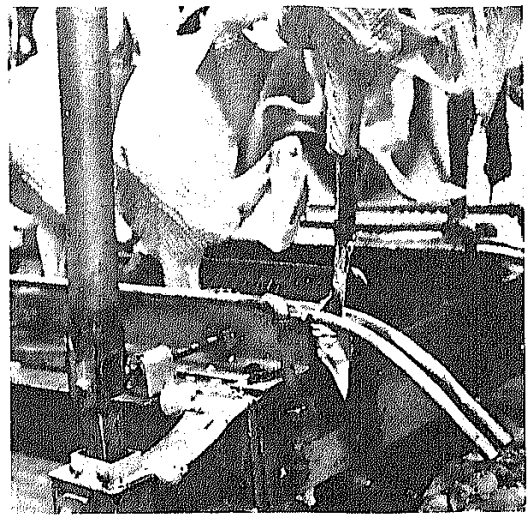
Releasing the head from the shackle requires very little worker time. Therefore, this procedure is combined with a house inspection in which the body cavity is checked to make sure that all of the viscera has been removed. These two procedures correspond with one MTM work element. As the bird approaches the mechanical head puller, the worker reaches into the body cavity with one hand and removes any viscera found remaining. With his other hand he lifts the bird's head out of the shackle to release it. Labor requirements for checking the body cavity and releasing the bird's head from the shackle were 0.478 man-minute for 10 hen turkeys and 0.560 man-minute for 10 tom turkeys, for a production rate of 3.04 more hen turkeys than tom turkeys per minute of operation.

Removing Head Mechanically

Numerous types of equipment are used for removing the head mechanically. The one most widely used is a V-shaped slot formed by two converging metal rods positioned directly under the overhead conveyor and over the offal trough (fig. 18). As the birds move along the line, the head catches in the slot, and is held in place and pulled off into the trough below as the bird moves onto the next processing step. This method is simple and positive; it requires no labor, and the cost for equipment, as well as for maintenance, is very low. Inasmuch as this processing step has no labor requirement, no MTM work element is involved.

Trimming Neck Skin—Element 14

When a head puller is used, the neck skin is stretched and torn apart, frequently leaving a ragged fragment of neck skin that detracts from the appearance of the bird unless it is trimmed. Factors such as bird size, line speed, and V-slot adjustment affect the amount of trimming and the number of birds that require attention. Average labor requirements for both hens and toms were 0.457 man-minute for 10 birds, for a production rate of 21.90 birds per minute of operation.



PN-2687

Figure 18.—Removing turkey head mechanically.

Removing Crop—Element 15

The crop and windpipe are usually removed from turkeys after the viscera and head have been removed from the carcass because removal of the viscera and head leaves both ends of the crop and windpipe detached, facilitating their removal. In element 4, "Splitting and Peeling Back Neck Skin," an incision was made at the base of the neck. This preparatory cut also helps make crop removal easier.

The operator steadies the bird with his left hand and reaches under the loose neck skin with his right hand in search of the crop. When he finds it, he grasps it firmly and pulls it down slightly. He then locates the windpipe and grasps it and the crop firmly. Exerting considerable force, he removes both parts (fig. 19) and drops them into the offal trough. Because a greater than average effort is required, a 10-percent fatigue allowance has been added to the assigned time value for the work element in this processing step.

Labor requirements for crop removal were 1.245 man-minutes for 10 hen turkeys and 1.513 man-minutes for 10 tom turkeys, for a production rate of 1.42 more hen turkeys than tom turkeys per minute of operation. These labor requirements were greater than those for any of the other work elements in the eviscerating operation.

PN-2688

Figure 19.—Worker removing crop and windpipe from tom turkeys.

Removing Lungs-Element 16

In all case study plants, lung removal was accomplished with a handheld vacuum gun of the shutoff-valve type. The worker uses his left hand to steady the bird while his right hand inserts the nozzle of the vacuum gun into the body cavity, opens the intake valve, and moves the nozzle orifice back and forth over the lungs (fig. 20). Three or four cycles of the scrubbing action were required to loosen and suck out all lung tissue when an efficient vacuum system was used.[13]

A hand-operated shutoff valve in the nozzle of the vacuum tool helps to maintain an adequate vacuum in the system, allows the operator to control and position the nozzle in the body cavity, and prevents accidential removal of edible tissue during insertion of the vacuum tool.

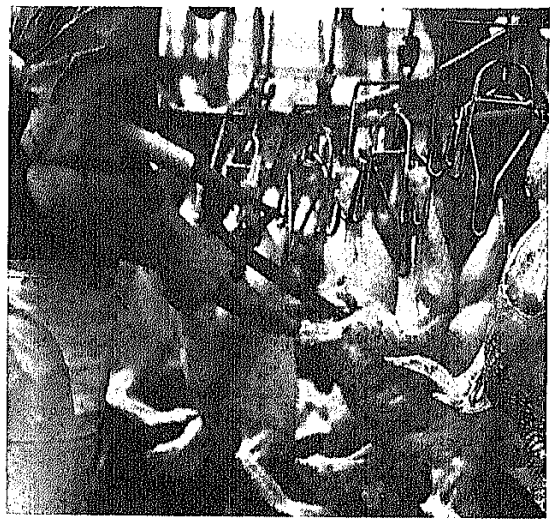
Labor requirements for lung removal were 0.678 man-minute for 10 hen turkeys and 0.747 man-minute for 10 tom turkeys, for a production rate of 1.36 more hen turkeys than tom turkeys per minute of operation.

[13] Walters, R. W., May, K. N., and Henry, F. E. A vacuum system for removal of lungs and other waste products from broilers. Univ. Georgia Col. Agr. Expt. Sta. in cooperation with U.S. Dept. Agr., Agr. Mktg. Serv. Cir. N.S. 17, 10 pp., 1960.

Washing Bird Inside—Element 17

The worker inserts a water-spray nozzle device, held in his right hand (fig. 21), into the body cavity while his left hand steadies the bird and helps guide the spray device. Using an up-and-down scrubbing action, he first rinses the interior. He then breaks through the membranes that separate the crop cavity from the body cavity and sprays the crop cavity thoroughly. The studies indicated that two up-and-down cycles were ample for thorough cleaning if sufficient water and water pressure were used.

Labor requirements for these procedures were 0.504 man-minute for 10 hen turkeys and 0.570 man-minute for 10 tom turkeys, for a production rate of 2.30 more hen turkeys than tom turkeys per minute of operation.

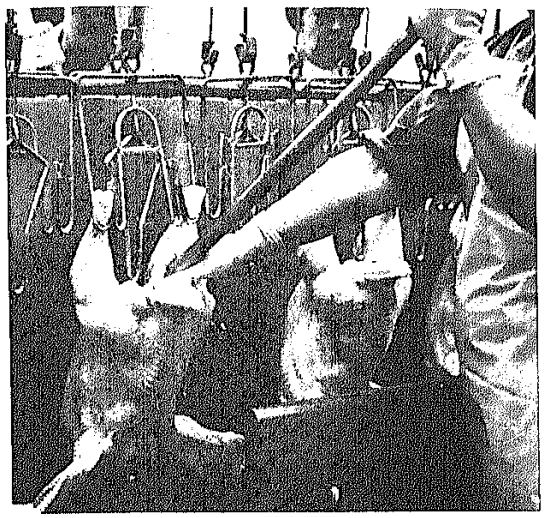


PN-2689

Figure 20.—Removing lungs with vacuum nozzle equipped with shutoff valve.

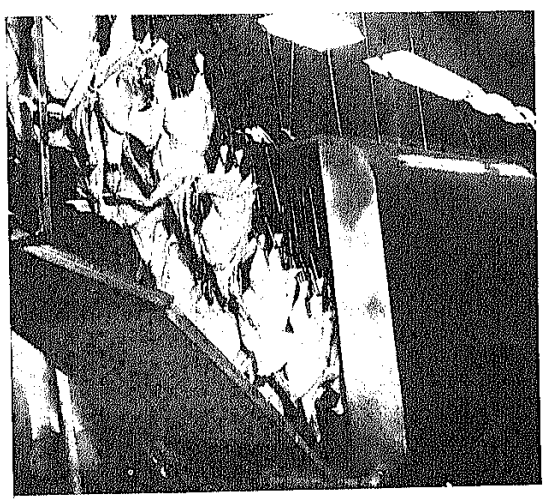
Washing Bird Outside

After being washed inside, the bird is moved through a water spray tunnel (fig. 22) where several banks of spray nozzles direct high-pressure streams of water against the exterior of the carcass. The tunnel is built over the offal trough so that the expended water falls into the trough to help float waste material from evisceration to the offal room. Because this processing step has no labor requirement, it was not included in the MTM analysis.



PN-2690

Figure 21.--Worker inserting spray nozzle into body cavity.



PN-2691

Figure 22.--Bird leaving water spray tunnel for washing exterior of carcass.

Severing Neck Vertebrae--Element 18

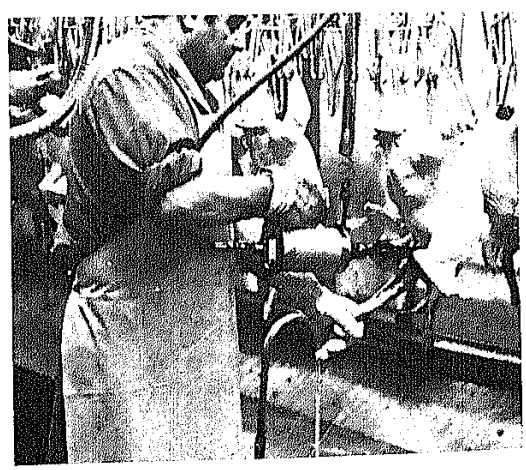
In some plants the bird's neck vertebrae are severed with a pair of handshears; other plants use air-actuated shears (fig. 23).[14] Either method of performing this processing step corresponds with one MTM work element. The handshears are much lighter and are more readily manuevered into position, but require a considerable effort to effect the cut. Equipment cost and maintenance are much lower for the handshears than for the air-actuated shears.

Handshears

The handshears used for severing the turkey's neck vertebrae must afford sufficient leverage to cut through these large bones; therefore, they must have long handles and both of the operator's hands must be used to operate them. As the bird approaches the operator, the operator positions the blades of the shears at the base of the bird's neck, and pulls the handles until he severs the boney structure only. This cut leaves the neck hanging by the skin tissue. (The operator severs the skin tissue with a knife and tucks the neck into the body cavity in the next operational element.)

Labor requirements for severing the neck vertebrae were 0.478 man-minute for 10 hen turkeys and 0.530 man-minute for 10 tom turkeys, for a production rate of 2.10 more hen turkeys than tom turkeys per minute of operation (table 5).

In some plants where it is predetermined that the birds are to be cut up or boned, the neck may be completely sheared from the carcass and dropped into a chill tank at this work station.



PN-2692

Figure 23.--Severing neck vertebrae with air-actuated shears.

[14] Because of their weight, air-actuated shears are suspended on an overhead spring balance.

TABLE 5.—Comparison of production rates and labor requirements for severing neck vertebrae of hen and tom turkeys by handshears and by air-actuated shears

Tool and turkey class	Labor requirement	Production rate
	Man-min./ 10 birds	*Birds/min.*
Handshears:		
Hens	0.478	20.92
Toms	.530	18.82
Air-actuated shears:		
Hens	.499	20.05
Toms	.523	19.12

Air-Actuated Shears

Holding air-actuated shears in his right hand, the operator grasps the bird's neck in his left hand, positions the shears at the base of the neck, and activates the blades. Labor requirements for performing these procedures were 0.499 man-minute for 10 hen turkeys and 0.523 man-minute for 10 tom turkeys, for a production rate of 0.93 more hen turkeys than tom turkeys per minute of operation.

For hen turkeys, the production rate resulting from se of the air-actuated shears was 0.87 less turkey per inute of operation than the rate resulting from use of e handshears. The slower production rate with the r-actuated shears occurred because the shears were tached to an overhead support and, therefore, could ot be positioned as quickly as the handshears.

For tom turkeys, the production rate resulting from se of the air-actuated shears was 0.30 more turkey per minute of operation than the rate resulting from use of he handshears. Although more time was required to position the air-actuated shears, very little effort was required to cut through the heavy neck vertebrae of the tom turkeys; consequently, less time was required to complete the cut than when the cut was completed manually.

Preparing Bird for Wrapping—Elements 19, 20, and 21

When the bird is to be marketed whole, it is prepared for wrapping[15] as follows: The neck skin is cut and the neck is inserted into the body cavity, the tail tendon is cut and the tail is tucked into the body cavity, after which the legs are trussed together over the base of the tail and under the bar strap. These prewrapping procedures give the bird a plumper appearance, provide for easier handling, packing, and storage, and make it easier for the housewife to place the whole bird into a roasting pan. If the bird is to be marketed boned or cut up, these prewrapping procedures are omitted. The processing steps in which the bird is prepared for market corresponds with three MTM work elements (19, 20, and 21), which are described in the following pages of this section.

Removing Neck and Inserting It Into Body Cavity—Element 19

At this point, the worker cuts the neck skin (the vertebrae having been previously severed, element 18) with a knife and inserts the neck into the body cavity. This worker occasionally trims excess neck skin; however, such trimming occurred infrequently in the case study plants and thus is not included in the basic time requirement established for this element.

Labor requirements for removing the neck and inserting it into the body cavity were 0.428 man-minute for 10 hen turkeys and 0.452 man-minute for 10 tom turkeys, for a production rate of 1.20 more hen turkeys per minute than tom turkeys.

Cutting Tail Tendon and Tucking Tail Down—Element 20

Using his left hand to steady the bird and his right hand to hold a knife, the worker cuts the tail muscle and tendon across the bird's back, allowing the tail to be bent downward. He then tucks the tail into the body cavity.

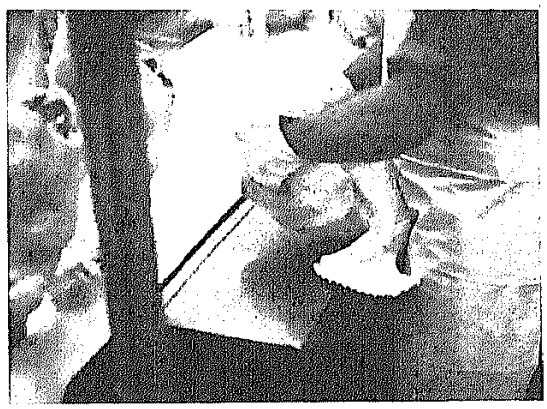
[15] For an analysis of the wrapping operation, see Walters, R. E., Improved equipment for weighing and packaging turkeys. U.S. Dept. Agr. ARS 52-24, 22 pp. 1968.

Labor requirements for this element were 0.558 man-minute for 10 hen turkeys and 0.600 man-minute for 10 tom turkeys, for a production rate of 1.25 more hen turkeys than tom turkeys per minute of operation.

Removing Bird From Shackle and Trussing Legs—Element 21

The worker removes the bird from the shackle and lays the carcass on its back on a table, with its anterior end against his body. To truss the legs, he grasps them (one in each hand) and with a downward and backward motion presses the legs against the body of the bird (fig. 24). Then, with a downward and forward motion, he pushes the hock joints under the previously prepared abdominal skin strap (element 8).

Labor requirements for removing the birds from the shackles and trussing them were 0.963 man-minute for 10 hen turkeys and 1.288 man-minutes for 10 tom turkeys, for a production rate of 2.62 more hen turkeys than tom turkeys per minute of operation.



PN-2693

Figure 24.—Worker placing hock joints under skin strap while trussing legs of tom turkeys.

WORK STATION LAYOUT

Work stations along the eviscerating line should be laid out in a way that will prevent the workers from having to make long reaches while performing the various work procedures. Handwash nozzles should be within convenient reach for the worker at each station. Where the height of the operation to be performed on the bird is above the elbow height of the worker, the workstand should be adjustable so the worker can change its height as necessary to prevent long reaches or to compensate for changes in overhead conveyor height (fig. 25). Stands should not be adjustable to a height exceeding 8 inches above the floor, because a greater height would be hazardous to worker safety. In places where more height is required, such as for the crop removal element, the conveyor height should be raised (fig. 26).

The guide rail (fig. 25) that prevents the bird from swinging and turning should be eliminated at stations where turning the bird makes operational procedures easier to perform. Examples of such procedures are those in shank removal, element 2. An effective layout for shank removal is shown in figure 27. The portable waste container shown in the layout is positioned close to the worker to provide for disposition of the severed shanks, which are too heavy to float in the flume provided for lighter offal.

A 9-inch-wide workcounter is provided at the giblet removal stations (fig. 25). The counter has small openings through which giblets are dropped into a flume for transport to the packaging area.

A convenient workcounter or table and a belt conveyor should be provided at the trussing station where the birds are removed from shackles. Figure 28 illustrates a suggested work station layout.

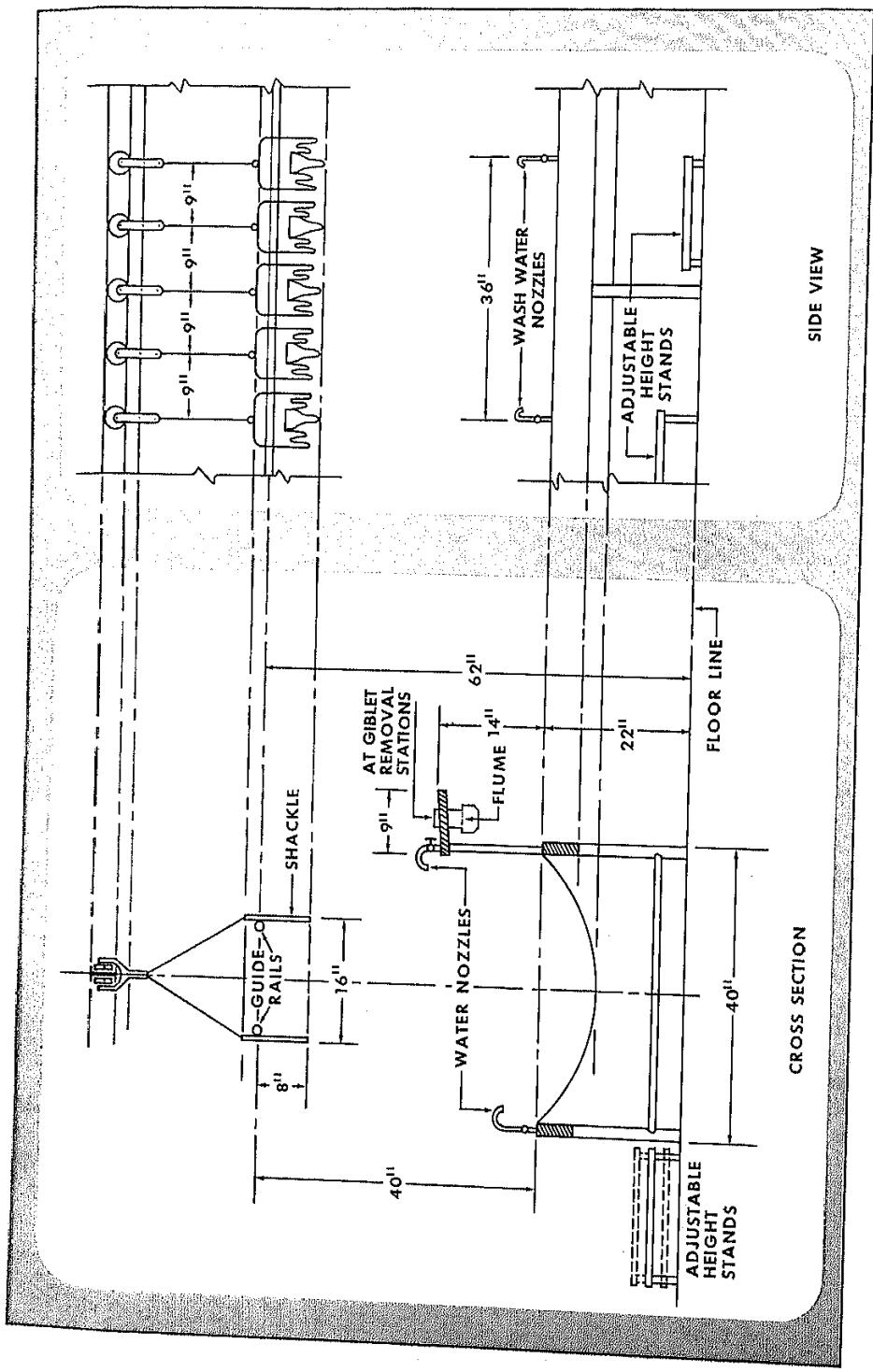


Figure 25.–Typical work station layout.

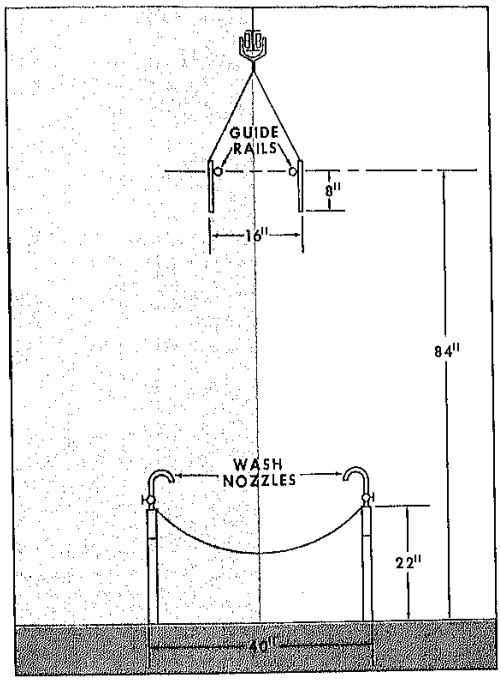


Figure 26.–Layout of work station for crop removal.

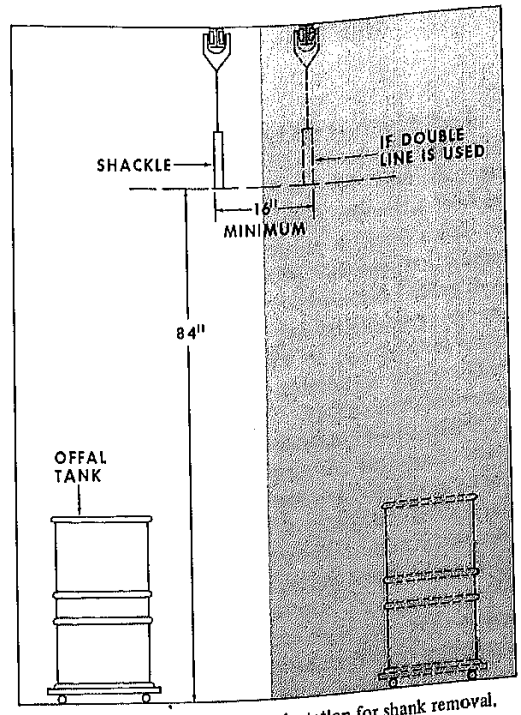


Figure 27.–Layout of work station for shank removal.

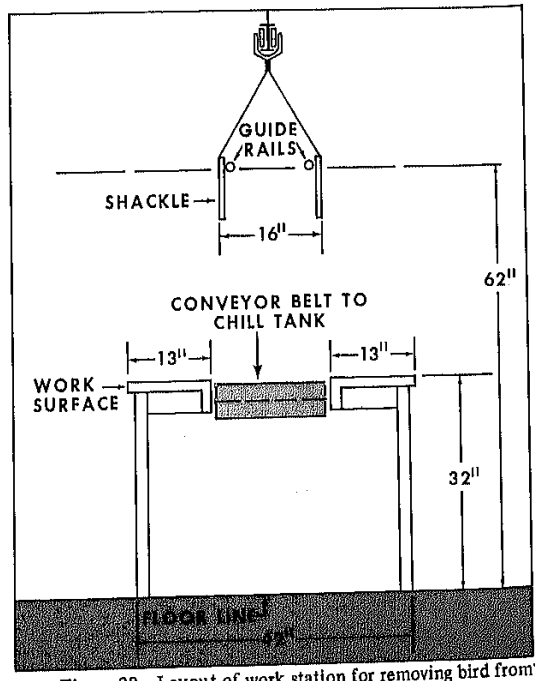


Figure 28.–Layout of work station for removing bird from shackle and trussing legs.

INFLUENCE OF LINE SPEED ON CREW BALANCE, PRODUCTION RATE, AND OPERATING EFFICIENCY

Production rates and labor utilization on the eviscerating line can be calculated at various line speeds by using the time values determined by MTM evaluation of each work element. Management can then use these rates to design the most efficient crew composition for any production rate and product combination of hen and tom turkeys that a commercial plant is likely to receive for processing. However, work assignments and operating methods vary so widely in the turkey-processing industry that all possible crew compositions cannot be described in this report.

Tables 6 and 7 describe a method for determining the most economical eviscerating line speed in an operation that uses conventional methods. The tables show values for a single-line operation, but production rates could be doubled if a double line were used. The production rates given in the tables, and the methods used that resulted in these rates, were selected from typical commercial eviscerating operations and do not constitute a recommendation as to the most efficient operating procedures; rather, they emphasize the effect that certain line speeds have on optimum utilization of manpower.

Labor utilization, production rates, and operating efficiency are affected by several factors. Underutilization of manpower frequently is tolerated by management because of operating situtations peculiar to the individual plant. Production rates are affected by the varying demand for different sizes and classes of the product and the consequent frequent necessity of switching from hen to tom turkeys several times during an 8-hour shift. To maintain the same number of workers in the crew, some workers must occasionally switch from one element to another for proper line balance in maintaining maximum efficiency.

Table 6 shows the most efficient line speed for hen turkeys to be 1,260 birds per hour with 34 workers (37.1 birds per man-hour). This line speed results in the utilization of 85.1 percent of the labor. Table 7 shows that if the same crew of 34 workers is to be maintained when the operation is switched to tom turkeys, a maximum line speed of 960 birds per hour (28.2 birds per man-hour) is required. This line speed results in 74.2-percent labor utilization. However, as is also shown in table 7, the most efficient line speed for tom turkeys is 840 birds per hour with 29 workers (29 birds per man-hour), with a 76.3-percent labor utilization. The slower line speed results in an increase of 2.1 percentage points in labor utilization.

The foregoing example of optimum labor utilization illustrates the care with which management should select its product combination (percentage of hens and toms in one day's production). Examination of the columns in tables 6 and 7 shows the percentages of labor utilization for the various line speeds. By using the table, management can identify the jobs in which labor utilization can be improved by having one well-trained worker handle more than one sequential work element (such as elements 2 and 3 for columns 3 and 4 of table 7). Management can also identify work assignments in which the number of workers who handle two sequential elements can be reduced by removing one worker from the line and dividing the assignments between those remaining (for example, elements 4 and 5 for columns 8 and 9 in table 6.) In both instances, however, reassessment and reassignment of work assignments would require the individual worker to operate at a utilization rate slightly greater than 100 percent. This would be a difficult rate requirement for a worker with average training and dexterity, but an average requirement only for a well-trained worker with better than average training and dexterity. The decisions involved in designing such job assignments and crew combinations depend on the type of operational procedure required and on management's knowledge of the individual worker's ability and willingness to perform at a pace faster than average.

TABLE 6.–Manpower required and labor utilized in eviscerating hen turkeys at 4 plant production rates; single-line conveyor

No. and description of work element	Established production rate per worker	Plant production rate, 900 birds/hr. (10 birds/min.)		Plant production rate, 1,080 birds/hr. (12 birds/min.)		Plant production rate, 1,260 birds/hr. (14 birds/min.)		Plant production rate, 1,440 birds/hr. (16 birds/min.)	
		Workers required	Labor utilization	Workers required	Labor utilization	Workers required	Labor utilization	Workers required	Labor utilization
	Birds/min.	*No.*	*Pct.*	*No.*	*Pct.*	*No.*	*Pct.*	*No.*	*Pct.*
1, Transferring birds to eviscerating line	24.10	1	62.2	1	74.7	1	87.1	1	99.6
2, Removing shanks	19.87	1	75.5	1	90.6	1	105.7	2	60.4
3, Removing oil gland	29.41	1	51.0	1	61.2	1	71.4	1	81.6
4, Slitting and peeling neck	15.00	1	100.00	2	60.0	2	70.0	2	80.0
5, Hanging bird in three-point suspension	20.60	1	72.8	1	87.4	1	101.9	2	58.3
6, Evacuating large intestine	25.98	1	57.7	1	69.2	1	80.8	1	92.4
7, Removing vent	11.58	2	64.8	2	77.7	2	90.7	2	103.6
8, Incising abdomen (bar-cut method)	17.15	1	87.5	1	105.0	2	61.2	2	70.0
9, Drawing viscera	10.22	2	73.4	2	88.1	2	102.7	3	78.3
10, Removing and trimming heart and liver	11.58	2	64.8	2	77.7	2	90.7	2	103.6
11, Removing viscera, and trimming, splitting, and washing gizzard	9.76	2	76.8	2	92.2	3	71.7	3	82.0
12, Peeling gizzard	11.68	2	64.2	2	77.1	2	89.9	2	102.7
13, Releasing bead from shackle and conducting house inspection of body	20.90	1	71.8	1	86.1	1	100.5	2	57.4
14, Trimming neck skin	21.90	1	68.5	1	82.2	1	95.9	2	54.8
15, Removing crop	8.03	2	93.4	3	74.7	3	87.2	3	99.6
16, Removing lungs	14.74	1	101.8	2	61.1	2	71.2	2	81.4
17, Washing bird inside	19.84	1	75.6	1	90.7	1	105.8	2	60.5
18, Severing neck vertebrae	20.92	1	71.7	1	86.0	1	100.4	2	57.4
19, Removing neck and inserting it into body cavity	23.36	1	64.2	1	77.1	1	89.9	1	102.7
20, Cutting tail tendon and tucking tail down	17.92	1	83.0	1	100.4	2	58.6	2	67.0
21, Removing bird from shackle and trussing legs	10.38	2	72.3	2	86.7	2	101.2	3	77.1
Total number of workers	--	28	--	31	--	34	--	42	--
Average labor utilization	--	--	73.6	--	79.8	--	85.1	--	78.7
Number of birds per man-hour	--	32.1		34.8		37.1		34.3	

TABLE 7.—Manpower required and labor utilized in eviscerating tom turkeys at 4 plant production rates; single-line conveyor

No. and description of work element	Established production rate per worker	Plant production rate, 600 birds/hr. (10 birds/min.)		Plant production rate, 720 birds/hr. (12 birds/min.)		Plant production rate, 840 birds/hr. (14 birds/min.)		Plant production rate, 960 birds/hr. (16 birds/min.)	
		Workers required	Labor utilization	Workers required	Labor utilization	Workers required	Labor utilization	Workers required	Labor utilization
	Birds/min.	*No.*	*Pct.*	*No.*	*Pct.*	*No.*	*Pct.*	*No.*	*Pct.*
1, Transferring birds to eviscerating line	21.69	1	46.1	1	55.3	1	64.5	1	73.8
2, Removing shanks	14.50	1	69.0	1	82.8	1	96.6	2	55.2
3, Removing oil gland	27.89	1	35.9	1	43.1	1	50.3	1	57.5
4, Slitting and peeling neck	10.92	1	91.6	2	54.9	2	64.1	2	73.3
5, Hanging bird in three-point suspension	14.71	1	68.0	1	81.6	1	95.2	2	54.4
6, Evacuating large intestine	25.98	1	38.5	1	46.2	1	53.8	1	61.6
7, Removing vent	9.67	1	103.4	2	62.0	2	72.4	2	82.7
8, Incising abdomen (bar-cut method)	14.88	1	67.2	1	80.6	1	94.0	2	53.8
9, Drawing viscera	9.12	2	54.8	2	65.8	2	76.8	2	87.7
10, Removing and trimming heart	11.45	1	87.3	1	104.8	2	61.1	2	69.9
11, Removing viscera, and trimming, splitting, and washing gizzard	9.48	1	105.5	2	63.3	2	73.8	2	84.4
12, Peeling gizzard	11.68	1	85.6	1	102.7	2	59.9	2	68.5
13, Releasing head from shackle	17.86	1	56.1	1	67.2	1	78.4	1	89.6
14, Trimming neck skin	21.90	1	45.7	1	55.0	1	63.9	1	73.1
15, Removing crop	6.61	2	75.6	2	90.8	2	105.9	3	80.7
16, Removing lungs	13.38	1	74.7	1	89.6	1	104.6	2	59.8
17, Washing bird inside	17.54	1	57.0	1	68.4	1	79.8	1	91.2
18, Severing neck vertebrae	18.87	1	53.0	1	63.6	1	74.2	1	84.8
19, Removing neck and inserting it into body cavity	22.12	1	45.2	1	54.2	1	63.3	1	72.3
20, Cutting tail tendon and tucking tail down	16.67	1	60.0	1	72.0	1	84.0	1	96.0
21, Removing bird from shackle and trussing legs	7.76	2	64.4	2	77.3	2	90.2	2	103.1
Total number of workers	--	24	--	27	--	29	--	34	--
Average labor utilization	--	--	65.8	--	70.3	--	76.3	--	74.2
Number of birds per man-hour	--	25.0		26.7		29.0		28.2	

APPENDIX

A. Description of Methods-Time-Measurement Technique With Illustrated Analyses Forms

To develop accurate time values for operations involving short, rapidly recurring work cycles, the methods-time-measurement (MTM) technique breaks time up into minute fractions identified as time-measurement units (TMU's). A TMU is equal to 0.00001 hour, or 0.0006 minute, or 0.036 second, and is used to calculate the time values in hours, minutes, or seconds. Application of conversion factors is illustrated on sample MTM analyses forms (pp. 26 through 34 in this appendix) after total TMU's have been adjusted for fatigue. The headings in the analyses forms are self-explanatory. The column headings refer to the procedure being evaluated (listed under Description), the pertinent hand—left (LH) or right (RH)—used for the procedure, and the time (TMU) required to accomplish the procedure. The letter symbols in each entry listed under LH and RH identify the MTM factor; for example, R, is reach, G, is grasp, and so forth. The figure symbols in each entry further identify the operation as to degree of complexity, length of reach, and so forth. In instances where a diagonal line has been drawn through an entry listed under either LH or RH for a particular procedure, the remaining entry listed identifies the longest time required to accomplish the procedure. This time value, listed under TMU, is the controlling value for the procedure and is used in calculating the total TMU for the element.

The MTM organization responsible for the proper use of this time measurement technique discourages its use without a thorough understanding of the application of the values that have been developed; consequently, these values are not reproduced here. Inquiries regarding this technique should be addressed to the MTM organization.[16]

B. Removing Vent And Incising Abdomen by J-Cut Method

Plants that cut up or bone a sizable part of their production use the J-cut method of opening the abdomen. This method eliminates the additional labor required to provide skin straps for trussing birds, inasmuch as straps are not needed for birds that are to be boned or cut up. This method combines elements 7 and 8, "Removing Vent" and "Incising Abdomen," described on pages 9 and 10. Compution of time values for performing these elements with the J-cut method are shown on the MTM analysis forms in appendix A.

When the J-cut method is used, the worker steadies the bird with his left hand while with his right hand, he incises a J-shaped cut that extends halfway around the vent and continues diagonally across the abdomen. He then cuts the vent loose by extending the loop of the J cut into a full circle around the vent and lifts it out (with intestine attached) to hang from the carcass. The labor requirements for this method are 1.040 man-minutes for 10 hen turkeys and 1.292 man-minutes for 10 tom turkeys, for a production rate of 1.88 more hen turkeys than tom turkeys per minute of operation.

A comparison of the labor requirements for removing the vent and incising the abdomen of 100 turkeys by the bar-cut and J-cut methods is shown in table 8. The comparison shows a labor saving of 4.06 man-minutes per 100 hen turkeys and 4.12 man-minutes per 100 tom turkeys when the J-cut method is used.

If any of the birds are to be sold in the whole, ready-to-cook form, a metal clip device is used in place of the skin bar or strap[17] for holding the legs in place when trussing. Some plant managers find it more convenient to use the J-cut method of opening the birds and then to install the metal clip for trussing the few birds they sell in the whole, ready-to-cook form.

One type of metal clip used for trussing the legs is shown in figure 29. This device is inserted into the body cavity on the conveyor line after all viscera has been removed and the bird has been washed inside and out, the neck tucked into the body cavity, and the tail tendon cut. Another worker is added to the eviscerating crew at this point to install the trussing clip. After the clip is installed, a worker tucks the bird's tail down and removes the bird from the shackle. He then tucks the bird's legs into the metal clip in the same manner as that previously described in element 21, "Removing Bird From Shackle and Trussing Legs." The time values for both procedures are the same.

[16] MTM Association for Standards and Research, Huron Towers, 2200 Fuller Road, Ann Arbor, Mich.

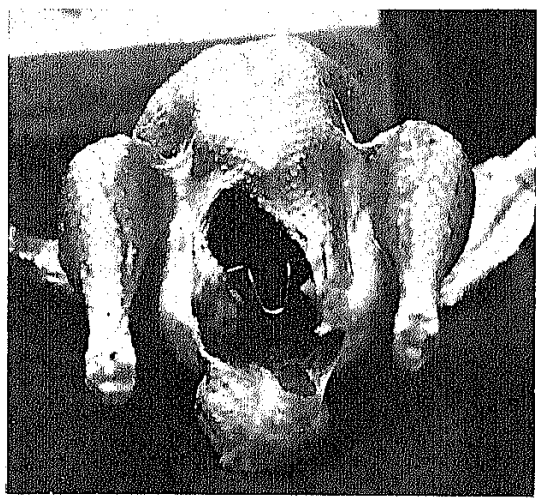
[17] Skin bar left across abdomen when bar-cut method is used, p. 9.

C. Inserting Metal Trussing Clip—Element 22

The metal clip is inserted through the body cavity opening and hooked into the bone and muscle tissue near the tail (fig. 29). The worker grasps three or four clips in one hand from a supply package on a stand at his work station while his other hand positions a single clip in the body cavity of each bird and presses it into place as the birds go by on the line. When three or four clips are installed, he reaches for another supply.

Labor requirements for installing metal clips were 0.533 man-minute for 10 birds (hens or toms), for a production rate of 18.07 birds per minute. To establish time values for comparing the J-cut method with the bar-cut method when preparing whole, ready-to-cook turkeys, the person computing time must add the time value for installing the metal trussing clip to the total time values for removing vent and incising the abdomen.

Table 9 shows time values of 15.73 man-minutes for 100 hen turkeys and 19.25 man-minutes for 100 tom turkeys, for a production rate of 1.27 minutes more time for 100 hen turkeys and 1.21 minutes more time for 100 tom turkeys with the J-cut method. Inasmuch as time values for placing the legs under the skin bar and for tucking the legs into the metal clip are the same, these additional values are the only labor factor to consider. However, the cost of a metal clip for each bird should be considered. When the two methods of opening birds are compared, the economy and flexibility that the J-cut offers should be considered if further processing (cut or deboned) is involved.



PN-2694

Figure 29.—Metal trussing clip positioned in the body cavity.

TABLE 8.—Labor requirements with the bar-cut and with the J-cut methods of removing vent and incising abdomen of 100 turkeys

Method and class	Requirement for removing vent[1]	Requirement for incising abdomen[2]	Total requirement
	Man-min./100 birds	*Man-min./100 birds*	*Man-min./100 birds*
Bar cut:			
Hens	8.63	5.83	14.46
Toms	10.34	6.70	17.04
J-cut:			
Hens	--	--	10.40
Toms	--	--	12.92

[1] See p. .
[2] See p. .

TABLE 9.—Labor requirements with bar-cut and with J-cut methods of removing vent, incising abdomen, and installing metal trussing clip for 100 whole ready-to-cook turkeys

Method and class	Labor requirement[1] for removing vent and incising abdomen	Labor requirement for installing metal clip	Total labor requirement
	Man-min./100 birds	*Man-min./100 birds*	*Man-min./100 birds*
Bar-cut:			
Hens	14.46	--	14.46
Toms	17.04	--	17.04
J-cut:			
Hens	10.40	5.33	15.73
Toms	12.92	5.33	18.25

[1] From table 8.

OPERATION TRANSFERRING BIRDS TO EVISCERATING LINE | ELEMENT NO. 1

METHOD DIRECT | ANALYST E.S. & W.S.

TURKEY CLASS HENS | DATE June, 1969

DESCRIPTION (left hand)	NO	L H	TMU	R H	NO	(right hand) DESCRIPTION
REACH TO SHACKLE		R20B	18.6	R20B		REACH TO BIRD
GRASP SHACKLE		G1A	2.0	G1A		GRASP NECK
HOLD SHACKLE		R20B	13.8	M6B12		HEAD FROM SHACKLE
RELEASE SHACKLE		RL1	2.0			HOLD BIRD
HAND UNDER BIRD			20.1	M14B12		MOVE BIRD TOWARD
HAND UNDER BIRD		G5	0.0			OTHER SHACKLE
BIRD TO EVISCERATING LINE		M12B6	16.4	M12B6		BIRD TO EVISCERATING LINE
BIRD TO SHACKLE		M6B6	11.6	M4C6		HEAD TO SHACKLE
HOLD BIRD			5.6	P1 SE		POSITION TO SHACKLE
DROP INTO SHACKLE		M6B6	11.6	M6B6		DROP HEAD INTO SHACKLE
RELEASE		RL2	2.0	RL1		RELEASE
			103.7			

PLUS 10% 10.4 FATIGUE ALLOWANCE

TOTAL 114.1 TMU

114.1 TMU × 10 × .0006 = .685 MIN. / 10 BIRDS

10 BIRDS ÷ .685 MIN. = 14.60 BIRDS / MIN.

OPERATION TRANSFERRING BIRDS TO EVISCERATING LINE | ELEMENT NO. 1

METHOD DIRECT | ANALYST E.S. & W.S.

TURKEY CLASS TOMS | DATE June, 1969

DESCRIPTION (left hand)	NO	L H	TMU	R H	NO	(right hand) DESCRIPTION
REACH TO SHACKLE		R20B	18.6	R20B		REACH TO BIRD
GRASP SHACKLE		61A	2.0	G1A		GRASP NECK
HOLD SHACKLE			20.3	M8B20		HEAD FROM SHACKLE
RELEASE SHACKLE		RLI	2.0			HOLD BIRD
HAND UNDER BIRD		R24B	25.2	M14B20		MOVE BIRD TOWARD
HAND UNDER BIRD		G5	0.0			OTHER SHACKLE
BIRD TO EVISCERATING LINE		M16B10	21.4	M16B10		BIRD TO EVISCERATING LINE
HOLD BIRD			13.2	M6B10		HEAD TO SHACKLE
HOLD BIRD			11.2	PISD		POSITION TO SHACKLE
DROP INTO SHACKLE		M8B10	15.7	M8B10		DROP INTO SHACKLE
RELEASE HOLD		RL2	2.0	RL1		RELEASE HOLD
			131.6			

PLUS 10% 13.2 FATIGUE ALLOWANCE

TOTAL 144.8 TMU

144.8 TMU X 10 X .0008 = .869 MIN. / 10 BIRDS

10 BIRDS ÷ .869 MIN. = 11.51 BIRDS / MIN.

OPERATION TRANSFERRING BIRDS TO EVISCERATING LINE | ELEMENT NO. 1

METHOD INDIRECT | ANALYST E.S. & W.S.

TURKEY CLASS HENS | DATE June, 1969

DESCRIPTION (left hand)	NO	L H	TMU	R H	NO	(right hand) DESCRIPTION
			15.8	R16B		REACH TO BIRD
			2.0	G1A		GRASP BIRD
REACH TO SHACKLE		R14B	15.7	M8B10		POSITION BIRD ON BELT
GRASP SHACKLE		G1A	5.6	G2		REGRASP BIRD
MOVE SHACKLE		M6B	15.8	M16B		HEAD TO SHACKLE
HOLD SHACKLE			8.9	M6B		DROP INTO SHACKLE
RELEASE SHACKLE		RL1	2.0	RL1		RELEASE
			65.8			

PLUS 5% 3.3 FATIGUE ALLOWANCE

TOTAL 69.1 TMU

69.1 TMU × 10 × .0006 = .415 MIN. / 10 BIRDS

10 BIRDS ÷ .415 MIN. = 24.10 BIRDS/ MIN.

PERATION TRANSFERRING BIRD TO EVISCERATING LINE | ELEMENT NO. 1

ETHOD INDIRECT | ANALYST E.S. & W.S.

URKEY CLASS TOMS | DATE June, 1969

ESCRIPTION (left hand)	NO	L H	TMU	R H	NO	(right hand) DESCRIPTION
			17.2	R18B		REACH TO BIRD
			2.0	G1A		GRASP BIRD
EACH TO SHACKLE		R16B	19.9	M10B15		POSITION BIRD
RASP SHACKLE		G1A	5.6	G2		REGRASP BIRD
OVE SHACKLE		M6B	15.8	M16B		HEAD TO SHACKLE
OLD SHACKLE			10.6	M8B		DROP INTO SHACKLE
ELEASE SHACKLE		RL1	2.0	RL1		RELEASE
			73.1			

PLUS 5% 3.7 FATIGUE ALLOWANCE

TOTAL 76.8 TMU

76.8 TMU X 10 X .0006 = .461 MIN. /10 BIRDS

10 BIRDS ÷ .461 MIN. = 21.69 BIRDS / MIN.

OPERATION REMOVING VENT AND INCISING ABDOMEN | Combining ELEMENT NO. 7 & 8

METHOD J-CUT | ANALYST E.S. & W.S.

TURKEY CLASS HENS | DATE June, 1969

DESCRIPTION (left hand)	NO	L H	TMU	R H	NO	(right hand) DESCRIPTION
REACH TO BIRD		R14B	14.4			
GRASP BIRD		G1A	2.0			
POSITION BIRD		M8B	10.6			
REGRASP AT VENT		G2	5.6			
HOLD			8.0	M4C		KNIFE TO BIRD
HOLD			5.6	P1SE		POSITION KNIFE
HOLD			32.0	M4C x	4	CUT ACROSS ABDOMEN
REGRASP VENT		G2	5.6			
HOLD ASIDE			5.6	G2		REGRASP KNIFE
			10.6	M8B		KNIFE BACK TO VENT
			26.8	M3C x	4	CUT AROUND VENT
REGRASP VENT		G2	5.6			
HOLD			20.1	M3C x	3	FINISH CUT AROUND VENT
PULL VENT OUT		M8B	10.6			
RELEASE		RL1	2.0			
			165.1			

PLUS 5% 8.3 FATIGUE ALLOWANCE

TOTAL 173.4 TMU

173.4 TMU X 10 X .0006 = 1.040 MIN. / 10 BIRDS

10 BIRDS ÷ 1.040 MIN. = 9.62 BIRDS / MIN.

OPERATION REMOVING VENT AND INCISING ABDOMEN | Combining ELEMENT NO. 7 & 8

METHOD J-CUT | ANALYST E.S. & W.S.

TURKEY CLASS TOMS | DATE June, 1969

DESCRIPTION (left hand)	NO	L H	TMU	R H	NO	(right hand) DESCRIPTION
REACH TO BIRD		R14B	14.4			
GRASP BIRD		G1A	2.0			KNIFE IN HAND
POSITION BIRD		M8B	10.6			
REGRASP AT VENT		G2	5.6			
HOLD			10.3	M6C		KNIFE TO BIRD
HOLD			5.6	P1SE		POSITION KNIFE
HOLD			40.0	M4C x	5	CUT ACROSS ABDOMEN
REGRASP VENT		G2	5.6			
HOLD			5.6	G2		REGRASP KNIFE
HOLD			12.2	M10B		KNIFE BACK TO VENT
HOLD			40.0	M4C x	5	TRIM AROUND VENT
REGRASP VENT		G2	5.6			
PULL SKIN ASIDE		M4B	6.9			
HOLD			26.8	M3C x	4	FINISH CUT AROUND VENT
PULL VENT OUT		M9B	11.6			
RELEASE		RL1	2.0			
			204.8			

PLUS 5% 10.3 FATIGUE ALLOWANCE

TOTAL 215.1 TMU

215.1 TMU X 10 X .0006 = 1.292 MIN. / 10 BIRDS

10 BIRDS ÷ 1.292 MIN. = 7.74 BIRDS / MIN.

OPERATION REMOVING AND TRIMMING HEART AND LIVER | ELEMENT NO. 10

METHOD SEPARATELY | ANALYST E.S. & W.S.

TURKEY CLASS HENS | DATE June, 1969

DESCRIPTION (left hand)	NO	L H	TMU	R H	NO	(right hand) DESCRIPTION
		REMOVE AND TRIM HEART				
REACH TO HEART		R10B	11.5			
GRASP HEART		G1C1	7.3			SCISSOR IN HAND
HOLD			5.2	M2C		SCISSOR TO CORD
HOLD			4.6	M2B		CUT CORD
HEART TOWARD NOZZLE		M6B	8.9	M6B		SCISSOR TO HEART
REGRASP HEART		G2	5.6			
HOLD HEART			5.2	M2C		SCISSOR TO POSITION
HOLD HEART			13.8	M2B x	3	TRIM HEART
HEART TO NOZZLE		M6B	8.9			
RINSE HEART	2x	M2B	9.2			
HEART TO FLUME		M8B	10.6			
RELEASE HEART		RL1.	2.0			
		REMOVE AND TRIM LIVER				
REACH TO LIVER		R10B	11.5			
GRASP LIVER		G1A	2.0			SCISSOR IN HAND
PULL LIVER OFF		M10B	12.2			
AND TO NOZZLE			5.2	M2C		SCISSOR TO LIVER
			13.8	M2B x	3	TRIM LIVER
REGRASP LIVER		G2	5.6			
RINSE LIVER	2x	M2B	9.2			
LIVER TO FLUME		M8B	10.6			
RELEASE LIVER		RL1	2.0			
			164.9			

PLUS 5% 8.3 FATIGUE ALLOWANCE

TOTAL 173.2 TMU

173.2 TMU X 10 X .0006 = 1.039 MIN. / 10 BIRDS

10 BIRDS ÷ 1.039 MIN. = 9.62 BIRDS / MIN.

OPERATION REMOVING AND TRIMMING HEART AND LIVER | ELEMENT NO. 10

METHOD SEPARATELY | ANALYST E.S. & W.S.

TURKEY CLASS TOMS | DATE June, 1969

DESCRIPTION (left hand)	NO	L H	TMU	R H	NO	(right hand) DESCRIPTION
		REMOVE AND TRIM HEART				
REACH TO HEART		R12B	12.9			SCISSOR IN HAND
GRASP HEART		G1C1	7.3			
HOLD HEART			6.7	M3C		SCISSOR TO CORD
HOLD HEART			4.6	M2B		CUT CORD
HEART TOWARD NOZZLE		M8B	10.6	M8B		SCISSOR TO HEART
REGRASP HEART		G2	5.6			
HOLD HEART			6.7	M3C		SCISSOR TO TRIM POSITION
HOLD HEART			13.8	M2B x	3	TRIM HEART
HEART TO NOZZLE		M8B	10.6			
RINSE HEART	2x	M2B	9.2			
HEART TO FLUME		M8B	10.6			
RELEASE HEART		RL1	2.0			
		REMOVE AND TRIM LIVER				
REACH TO LIVER		R12B	12.9			
GRASP LIVER		G1A	2.0			
APPLY PRESSURE		AP2	10.6			SCISSOR IN HAND
PULL LIVER OFF		M10B	12.2			
AND TO NOZZLE			6.7	M3C		SCISSOR TO LIVER
			13.8	M2B x	3	TRIM LIVER
REGRASP LIVER		G2	5.6			
RINSE LIVER	2x	M2B	9.2			
LIVER TO FLUME		M8B	10.6			
RELEASE LIVER		RL1	2.0			
			186.2			
	PLUS	5%	9.3	FATIGUE ALLOWANCE		
	TOTAL		195.5	TMU		

195.5 TMU X 10 X .0006 = 1.173 MIN. / 10 BIRDS

10 BIRDS ÷ 1.173 MIN. = 8.53 BIRDS / MIN.

OPERATION INSERT METAL TRUSSING CLIP | ELEMENT NO. 22

METHOD | ANALYST E.S. & W.S.

TURKEY CLASS BOTH HENS AND TOMS | DATE June, 1969

DESCRIPTION (left hand)	NO	L H	TMU	R H	NO	(right hand) DESCRIPTION
REACH TO PACKAGE		R20B				
OF WIRE LOCKS 1/4		G1C1	11.6			
(GRASP 4)		M24B				HAND TO BIRD
REGRASP LOCK TO FINGERS		G2	5.6			
MOVE LOCK INTO CAVITY		M10C	13.5			
POSITION LOCK		P2NSD	26.6			
			10.6	R8B		HAND TO CAVITY
LOCK INTO PLACE		M26	5.2			
			2.0	G14		GRASP LOCK
			2.0	MFB		SECURE LOCK
RELEASE		RL1	2.0	RL1		RELEASE
HAND OUT		M6B	8.9	R6B		HAND OUT
			88.0			

PLUS 5% 4.4 FATIGUE ALLOWANCE

TOTAL 92.4 TMU

92.4 TMU × 10 × .0006 = .553 MIN. / 10 BIRDS

10 BIRDS ÷ .553 MIN. = 18.07 BIRDS / MIN.